PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/NL2004/000051	21 01 2004	

International Patent Classification (IPC) or both national classification and IPC
B01J23/72, B01J37/08, C07C29/154, B01J23/745, B01J23/89

Applicant
AVANTIUM INTERNATIONAL B.V.

1. This opinion contains indications relating to the following items:

- ☒ Box No I Basis of the opinion
- ☒ Box No II Priority
- ☐ Box No III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No IV Lack of unity of invention
- ☒ Box No V Reasoned statement under Rule 43*bis* 1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No VI Certain documents cited
- ☐ Box No VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the International application

2 **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66 1*bis*(b) that written opinions of this International Searching Authority will not be so considered

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220

3 For further details, see notes to Form PCT/ISA/220

Name and mailing address of the ISA:

European Patent Office
D-80298 Munich
Tel +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized Officer

Jourdan, A

Telephone No +49 89 2399-8349

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No
PCT/NL2004/000051

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was field, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ in written format

   ☐ in computer readable form

   c. time of filing/furnishing:

   ☐ contained in the international application as filed

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. II Priority

1. ☒ The following document has not been furnished:

   ☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

   ☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

   Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3 Additional observations, if necessary:

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:

   ☒ paid additional fees

   ☐ paid additional fees under protest.

   ☐ not paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees

3 This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13 3 is

   ☐ complied with

   ☒ not complied with for the following reasons:

   see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

   ☒ all parts

   ☐ the parts relating to claims Nos.

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	4,7-10,12,14,18,24-26,29-30
	No:	Claims	1-3,5-6,11,13,17,19-23,27-28,31
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-31
Industrial applicability (IA)	Yes:	Claims	1-31
	No:	Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (SEPARATE SHEET)

International application No
PCT/NL2004/000051

Re Item IV.

This Authority considers that there are two inventions covered by the claims indicated as follows:

I: Claims 1-22,31 directed to a method for the preparation of a supported chromium-free catalyst comprising copper and at least one second metal, a catalyst obtainable by the method and use thereof for the hydrogenation of fatty acids, esters and diesters

II: Claims 23-31 directed to a chromium-free catalyst comprising copper and a second metal (zinc or iron) supported on silica, zirconia or magnesia and having 5-50 wt% metal (Cu + Fe/Zn) and an atomic ratio of copper to the second metal (zinc/iron) of 0.1-10, and use thereof for the hydrogenation of fatty acids, esters and diesters.

The common concept of a supported chromium-free catalyst comprising copper and at least one second metal is not novel over the prior art US-A-4 876 402: column 4, line 59 to column 5, line 6; column 3, lines 28-39; column 4, lines 3-5; colun 8, lines 6-13 or US-A-4 279 781: claims 1,3; column 2, lines 60-65; column 6, lines 20-34.

It follows that the specific preparation method as claimed in claims 1-20 and a catalyst prepared accordingly, as far as it is novel, makes a contribution over this prior art and can be considered as a special technical feature within the meaning of Rule 13.2 PCT. For the second group of inventions it seems that the combination of a specific carrier and the wt% ranges as claimed makes a contribution over this prior art.

Examining the possible correspondence by technical effect, one finds that the technical effect of the first invention seems to be an improvement in selectivtiy and/or activity in the hydrogenolysis of methyl laurate. No specific technical effect can be derived for the the second invention. There is no basis in the present application that a catalyst as stipulated in claims 23-30 prepared according to whatever method will show the same improved catalytic properties.

This appears to show a lack of corresponding technical effect. Consequently, neither the objective problem underlying the subjects of the claimed inventions, nor their solutions defined by the special technical features allow for a relationship to be established between the said inventions, which involves a single general inventive concept.

In conclusion, the groups of claims are not linked by common or corresponding special technical features and define two different inventions not linked by a single general inventive concept.

The application, hence does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.

Re Item V.

1 The following documents are referred to in this communication:

D1: US-A-4 279 781 (DIENES EDWARD K ET AL) 21 July 1981 (1981-07-21)
D2: US-A-4 876 402 (MERRIAM JAY S ET AL) 24 October 1989 (1989-10-24)
D3: US-A-4 291 126 (SUGIER ANDRE ET AL) 22 September 1981 (1981-09-22)
D4: US-A-4 552 861 (CHAUMETTE PATRICK ET AL) 12 November 1985 (1985-11-12)
D5: GB-A-1 600 517 (CHEVRON RES) 14 October 1981 (1981-10-14)
D6: EP-A-0 320 074 (MEERN BV ENGELHARD DE) 14 June 1989 (1989-06-14)
D7: WANG Z ET AL: "Studies on the active species and on dispersion of Cu in Cu/SiO2 and Cu/Zn/SiO2 for hydrogen production via methanol partial oxidation" INTERNATIONAL JOURNAL OF HYDROGEN ENERGY, ELSEVIER SCIENCE PUBLISHERS B.V., BARKING, GB, vol. 28, no. 2, February 2002 (2002-02), pages 151-158, XP004394393 ISSN: 0360-3199
D8: EP-A-0 372 544 (KAO CORP) 13 June 1990 (1990-06-13)
D9: US-A-5 302 568 (MATSUDA MORIO ET AL) 12 April 1994 (1994-04-12)

2 Document D1 discloses a catalyst for the methanol synthesis. The catalyst is derived by in situ reduction from a catalyst precursor comprising copper oxide and zinc oxide carried on a thermal stabilizing metal oxide such as aluminium oxide. The catalyst precursor can be prepared by contacting a mixed solution of copper ammine carbonate complex and zinc ammine carbonate complex with the thermal stabilizing metal oxide and subsequent calcination thereof. The pH value of the mixed copper zinc solution is not disclosed, however with regard to the nature of the ammine carbonate complex it seems to be inherent that it is above 5. (See

passages cited in the international search report)

2.1 INDEPENDENT CLAIMS 1 AND 21
As can be seen from the above, document D1 discloses in combination all the features defined in independent claims 1 and 21. Hence the subject-matter of these claims is not new (Article 33(2) PCT).

3 Document D2 discloses a reduced catalyst precursor comprising copper oxide and zinc oxide impregnated with a selectivity enhancer such as alkali metal, nickel or cobalt. The catalyst may be supported on e.g. on silica, alumina, zirconia etc. The catalyst precursor may be prepared by the thermal decomposition of an aqueous mixture of copper and zinc ammine complexes in the presence of a thermally stabilizing carrier such as hydrated alumina. D2 does not explicitly disclose the pH value of the aqueous mixture of copper and zinc ammine complexes. However, for the same reason as indicated for document D1, it seems that it is inherently disclosed. See passages cited in the international search report)

3.1 INDEPENDENT CLAIMS 1 AND 21
As can be seen from the above, document D2 discloses in combination all the features defined in independent claims 1 and 21. Hence the subject-matter of these claims is not new (Article 33(2) PCT).

4 DEPENDENT CLAIMS 2, 3, 5, 6, 11, 13, 17, 19, 20, 22
Dependent claims 2, 3, 5, 6, 11, 13, 17, 19, 20, 22 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty over D1 or D2 (Article 33(2) PCT).

5 DEPENDENT CLAIMS 4, 7-10, 12, 14-16, 18
The combination of the features of dependent claims 4, 7-10, 12, 14-16, 18 does not seem to contain one or more features that could form the basis for an inventive step (Article 33(3) PCT) with regard to the combination of D1 or D2 with common general knowledge.

6 Document D7 discloses a catalyst for the production of hydrogen via methanol partial oxidation. The $Cu/Zn/SiO_2$ catalyst has a Cu loading of 10% and a Cu/Zn molar ratio of 2:8.

6.1 INDEPENDENT CLAIM 23

As can be seen from the above, document D7 discloses in combination all the features defined in independent claim 23. Hence the subject-matter of this claim is not new (Article 33(2) PCT)

7 Document D6 discloses a supported catalyst with copper as the active component and iron as the promotor. The proportion of iron being no more than 25 % calculated on an atomic basis. The carrier is preferably silica. The catalyst is prepared from the nitrate salts. It can be used inter alia for the hydrogenolysis of esters.

7.1 INDEPENDENT CLAIMS 27 AND 31

As can be seen from the above, document D6 discloses in combination all the features defined in independent claims 27 and 31. Hence the subject-matter of these claims is not new (Article 33(2) PCT).

8 Document D8 discloses a catalyst for the hydrogenation of unsaturated aliphatic nitriles. The catalyst comprises copper, a group VIII platinum metal and a transition metal such as e.g. iron, cobalt, nickel, zinc on a support. The support may be selected from a list which contains alumina, silica, active carbon, zeolite and the like. In the examples Cu/Fe/Rh and Cu/Zn/Rh have been supported on zeolite. With regard to the list of possible carriers, it has been obvious for the skilled person to replace zeolite by silica.

8.1 INDEPENDENT CLAIMS 23 AND 27

As can been seen from above it has been obvious to arrive at the subject-matter of independent claims starting from D8. Hence the subject-matter of these claims does not involve an inventive step (Article 33(3) PCT).

8.2 DEPENDENT CLAIMS 24-26 and 28-30

The combination of the features of these dependent claims does not seem to contain one or more features that could form the basis for an inventive step (Article 33(3) PCT) with regard to the teaching of D8.

9 Document D9 discloses the hydrogenation of fatty acid ester with a catalyst comprising a supported Cu/Fe/Al catalyst. Examples 8 and 12 show such a catalyst supported on zirconium oxide and magnesium oxide. Copper and iron are present on the catalyst in a ratio of 1:1. D9 does not the amount of Cu+Fe being supported on the carrier material. A wt% range of 5 to 50 is however rather common in the art. Accordingly, in absence of a technical effect that is related to this wt% range, it has to be regarded as a parameter from which the skilled person would have selected on the basis of his common knowledge.

9.1 INDEPENDENT CLAIMS 27 AND 31

As can been seen from above it has been obvious to arrive at the subject-matter of independent claims starting from D9. Hence the subject-matter of these claims does not involve an inventive step (Article 33(3) PCT).

9.2 DEPENDENT CLAIM 28

The combination of the features of these dependent claims does not seem to contain one or more features that could form the basis for an inventive step (Article 33(3) PCT) with regard to the teaching of D9.